



National Park Service Big Cypress National Preserve Fire Ecology Annual Report Calendar Year 2019

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A. Summary

The Fire Effects crew at Big Cypress National Preserve (BICY) completed a wide variety of fuels and non-fuels projects in the 2019 calendar year. Accomplishments include:

- A total of 50,282 acres were treated with fire this year. 15 prescribed fire treatments (49,161 ac) and 13 wildfires (1,121 ac).
- Mechanical treatments and prescribed fires were used to protect 73 private structures, 112 NPS structures, over 19.5 miles of roadways and 159 Red Cockaded woodpecker trees from potential wildfire impacts.
- The Fire and Aviation Division acquired grant funding to support prescribed fire treatments in several high priority areas. The National Wild Turkey Federation (\$20,000), the Florida National Parks Trust (\$50,000) and a private donation (\$6,000).
- The Fire and Aviation Division worked with Resource Management to acquire \$492,000 for Burned Area Rehabilitation (BAR) within the Avian Complex and Cowbell Wildfire areas. Over 10,000 acres of mixed density Category 1 invasive species were treated including melaleuca, Brazilian pepper and old world climbing fern.
- Crewmembers worked with Interpretation Division to participate in over 6 educational and community outreaches including swamp walks, science fair judging and community events.
- Lead completed written documentation of Photopoint and Photoseries protocols that are currently utilized by the monitoring crew.
- Successfully input all Photoseries project data to FFI (2016-2019). Regional Office support has also contributed to the conversion of all historical photopoint effects data from Excel to FFI. This project will be completed in 2020.
- A comprehensive Fire Program Review occurred with a focus on Ecology and Monitoring.

Table 1. Fire Effects Plot Workload (2019) and Total Plots Installed

Park	Monitoring Unit	Plot Type	Pre-burn	Immed Post	Postburn* (1-20 yrs)	Annual Total	Total Plots
Big Cypress	Slash Pine	Photopoint	4	2	24	26	37
		Photoseries	0	0	5	5	8
	Prairie	Photopoint	14	7	17	24	31
		Photoseries	0	0	1	1	6
	Cypress Savannah	Photopoint	4	1	4	5	11
		Photoseries	1	0	0	1	3
	Hammock	Photopoint	0	0	0	0	1
		Photoseries	-	-		-	-
Total			14	10	47	63	80**

* Pre-burn site visits only occur if a plot hasn't been burned within 6 years or it has been over three years since the last site visit. These plots are included in the Post Burn (1-20years) site visit statistics.

**Grand total includes only photopoint plot types because the photoseries data collection protocols occur at already established photopoint locations.

Table 2. Fire Ecology Staffing 2019

Ecologist and Monitors	Starting Date	Ending Date	# of Pay Periods	READ Qualified (Yes or No)	Training and Development
Jill Waisley (Fire Ecologist)	1/1/19	12/31/19	26	No	- Worked toward: RXB2 (t) and maintained SEMG qualification - Attended: AFE Fire Conference
Megan Hurrell (Lead Fire Effects Monitor)	1/1/19	12/31/19	26	No	- Worked toward: IC4 (t), FIRB (t), RXB3 (t) - Detailed GS7 supervisory lead in fire effects and as HRAP in the Forest Service in R1 - Completed: ABRO task book - Attended: S-200, Rappel vet, AFE Fire Conference, and Python capture training
Trevor Williams (Seasonal Monitor)	1/1/19	4/26/19	8	No	- Worked toward: FFT1 / IC5 (t) / FEMO (t) - Attended: Wilderness First Aid
Tim Guartha (Seasonal Monitor)	1/1/19	3/22/19	6.5	No	- Worked toward: FEMO and Technical specialist task books
Josh Moore (Seasonal Monitor)	11/11/19	12/31/19	4	No	- Working on: FFT1 (t) - Opened: IC5 / FEMO task books - Attended: Python capture training
Seth Williams (Seasonal Monitor)	10/27/2019	12/31/19	5	No	- Working on: FFT1 (t) - Opened: FEMO task books - Attended: S-200 and Python capture training

Table 3. 2019 Management Objectives and Monitoring Results

Monitoring Unit	Management Objective (Restoration)	Monitoring Results (XX% confidence interval)	Objective Achieved?	Year Analysis Completed (Range of Data [Yrs] Included in Analysis)
Slash Pine	Treat >70% of pinelands in BICY at least once within 7 years	Fuel reduction treatments for the last 7 years occurred in 83% of pinelands in BICY at least once <i>79,676 of hydric and mesic pineland flatwoods were treated during 302 fires within last 7 years (93,750 total acres of pinelands). With 14,074 acres treated multiple times.</i>	YES	2019 (2013-2019)
	Reduce woody shrub height >50% one year post burn (when compared to pre-treatment) in pinelands	Ocular Estimation at photopoint sites determined that >50% reduction in shrub height occurred 1 year post at 95% of the plots. <i>n=19. Nineteen site visits were analyzed via ocular estimation one-year post treatment within 30m radius of plot center.</i>	YES	2019 (2018-2019)
Prairies	Treat >70% of prairies in BICY at least once within 7 years.	Fuel reduction treatments for the last 7 years occurred in 67% of prairies in BICY at least once <i>44,565 acres of wet prairie were treated during 299 fires within last 7 years (68,413 total acres of prairie). With 24,077 acres treated multiple times.)</i>	NO	2019 (2013-2019)
	Reduce woody shrub height >50% one year post burn (when compared to pre-treatment) in prairies	Ocular Estimation at photopoint sites indicate that >50% reduction in shrub height occurred 1 year post at 67% of the plots <i>n=3. Three site visits were calculated via ocular estimation and photopoint monitoring.</i>	YES	2019 (2018)
Slash Pine & Prairies	Top-kill at least >75% of woody shrubs during each treatment	Ocular Estimation at photopoint sites indicate that at least >75% of woody shrubs were top killed at 89% of the plots. <i>n=9. Nine site visits were analyzed via ocular estimation one-year post treatment within 30m radius of plot center.</i>	YES	2019 (2019)

B. Program Information

Table 4. Planning - 2019

Park	Does Park have written Desired Future Conditions? (yes or no)	Date Park-level Monitoring Plan completed (or revised)	Total # of Project- or Community-level Monitoring Plans (not just 2019)	Assisted with how many BAER/BAR plans/updates in 2019?
Big Cypress National Preserve	NO	2013	0	3

Table 5. Monitoring - 2019

Park	% 2019 Data Entered	% 2019 Data Quality Checked	# Prescribed Fires Monitored	# Non-fire Fuels Treatments Monitored	# Wildfires Monitored	# BAER/BAR Treatments Monitored
Big Cypress National Preserve	100%	100%	29* 2**	0	15* 0**	2

*Number of treatment units with burn-day monitoring only.

** Number of treatment units with treatment effects monitoring conducted. Include pre-burn and post-burn monitoring but not burn-day monitoring.

Table 6. Communicating Results - 2019

Park	# of Project Monitoring Reports completed in 2018	# of Annual meeting(s) with Park staff	# of Formal presentations of results*	Do you use Minitab?
Big Cypress National Preserve	0	3	1	No

* Provide the National Wild Turkey Federation with our results of burned habitat

Table 7. Research - 2019

Park	Are research needs identified in FMP or Monitoring Plan? (yes or no)	# of Proposals Submitted in 2018	# of Proposals Funded in 2018	# of Research Projects Supported in 2018*	Additional Comments
Big Cypress National Preserve	Yes*	0	0	3	RCW monitoring, Florida panther research, black rail

* Additional research needs are being considered and will be included in the next Monitoring Plan update.

C. Ecologist and Monitoring Crew accomplishments and areas of focus

The 2019 fire effects crew comprised of permanent and seasonal staff, University employees and volunteers. The various skill sets allowed for a very dynamic and successful monitoring season. Coordination between educators, volunteers, resource managers, and operational personnel is essential to the Big Cypress Fire Ecology Program.

Throughout the prescribed fire season we worked closely with University of Central Florida to develop a resource sharing relationship. Although this was the first year, four individuals volunteered for both prescribed fires and to assist the Lead in pre- and post-burn fire effects monitoring. There are plans to continue and expand this relationship in 2020.

In addition to participating on prescribed fires and wildfires, the seasonal fire staff assisted with the completion of field work and documentation of monitoring protocols. The crew Lead worked to standardize details of the sampling techniques throughout the year and to explore new methods for data collection. The Photo Load sampling technique was presented at the AFE Conference and the Monitoring crew hopes to incorporate this into the program in the future. This protocol has potential to decrease in the amount of time at each plot and an increase in the consistency and accuracy of cover estimates.

Support from Resource Management and local cooperators have enabled the BICY Ecology Program to explore additional monitoring strategies. This coordination will facilitate the alignment of the monitoring objectives to meet resource management goals. As the BICY monitoring program evolves, it will continue to incorporate sampling techniques based on the best possible science and utilize more spatially oriented monitoring strategies.

The monitoring information will continue to be shared with our partners. Education and outreach activities include working with the South Florida National Parks Trust during community outreach events, participating in Interpretative Division swamp walks with 6th grade students, completing the end-of-year report for the National Turkey Federation and multiple other miscellaneous activities throughout the year. Educational outreach activities will be incorporated into 2020 planning and will include things such as a series of Facebook fire education posts.

We hope to provide additional education and operationally based experiences to our partners and cooperators in order ensure a comprehensive understanding of fire on the landscape. Coordination between educators, volunteers, resource management and fire personnel has helped to increase understanding of flood and fire on the landscape and the quality of the fire effects monitoring at Big Cypress.

C. Fire ecologist accomplishments and areas of focus

Table 8. Fire Ecologist 2018 Accomplishments/Focus Areas

Category	Percent Time	Accomplishments and/or areas of activities
Prescribed Burning planning and prep	15%	<i>Planning for prescribed fire treatments</i> <i>Work on the Interim MRA</i> <i>Finish Cape Canaveral Burn Plan for Apollo Units</i> <i>Fire GIS data collection, management and reporting</i> <i>Work with Resource Management and cooperators to capture/update geospatial values-at-risk.</i>
Training/Conferences	2%	<i>AFE Conference and Regional FMO/Ecology meeting</i>
Data Collection	5%	<i>Plot work</i>
Data Entry	15%	<i>2019 Photopoint data has been entered into FFI for the first time and protocols requiring customization have been identified.</i> <i>Photoseries data (2016-2019) for all 16 plots has been entered into FFI</i> <i>Review written photopoint and photoseries protocol processes</i> <i>Identify data entry protocol issues and communicate with Regional/National Office and contractor for historical database conversion.</i> <i>NFPORS</i> <i>Fire and ecology related GIS data management and map creation</i>
Admin / Supervisory / Misc.	20%	<i>Complete seasonal on-boarding/refresher, DOI Talent training, QuickTime certifier, EPAPs were completed for two seasonals and one FTE</i> <i>On-boarding and tracking of four monitoring volunteers</i> <i>General administration/meeting</i> <i>Got approval to fill vacant position and completed new hiring packet for the GS7 FTE position which will start in 2020.</i> <i>By-weekly leadership meetings</i> <i>Tracking RAWs station maintenance and repair schedule</i> <i>Update roles and responsibilities within the Ecology Program</i> <i>PT</i>
Data Analysis	10%	<i>Minimal data analysis was completed. Photopoint plots were visually examined and cross compared with historical fire treatment areas to explore the effects of recent fire treatments.</i> <i>Tracking of ground observations of where treatments are needed in the future and when.</i> <i>GIS data analysis of fires and values-at-risk</i>
Interagency / Cooperators / Outreach	13%	<i>Wine and Wildlife with the National Park Service Trust</i> <i>Coordinated three University of Central Florida and one public volunteer to assist with monitoring field work</i> <i>Work with Interp to develop prescribed fire Facebook series for 2020</i> <i>Review "Flood and Fire" document</i>
Wildfires	5%	<i>Complete pre-use inspections and manage SEATs at Immokalee Tanker Base.</i>
Grants	15%	<i>National Turkey Federation Grant</i> <i>National Trust Grant submission</i> <i>Work with Resource Management to track funds and complete BAR reports</i>

D. Fire effects crew accomplishments and areas of focus

Table 9. Fire Effects Crew 2019 Accomplishments/Focus Areas

Category	Percent Time	Notes
Data Collection	17%	<i>This includes both photopoints and fuel loading photoseries plots.</i>
Wildfire Assignments (Off-unit)*	0%	<i>The crew did not respond to off unit fires.</i>
Wildfire response (in BICY)	4%	<i>The crew responded to 7 wildfires within BICY.</i>
Prescribed fire projects	32%	<i>Crew lead and assisted in preparation that included Red Cockaded Woodpecker tree clearing, power poll and line clearing, removing hazardous trees and prepping around private properties, mixing fuel and preparing equipment, as well as, scouting burn locations and fuel conditions. Crew assisted as ENGB, FFT1, FFT2 and FEMO on 7 prescribed fires within BICY, and 8 prescribed fires off-unit.</i>
- Operations	17%	
- Prep / Planning	15%	
Data entry	7%	<i>Completed data entry and quality checked for 2019 into FFI.</i>
Data analysis	1%	<i>Data analysis limited in FFI and for end of year monitoring report.</i>
Supervision / Admin / Meetings	15%	<i>Payroll, travel authorization/voucher, division meetings, hiring process etc.</i>
Training / Conferences	8%*	<i>Each crew member completed refresher training, python handling, and terra torch operations. Seasonals completed S-200 and WFR refresher. Lead monitor completed S-200 and attended the AFE Conference.</i>
Miscellaneous / Outreach / Research Cooperation**	7%	<i>Crew members assisted other divisions with education outreach swamp walks and outdoor adventure days, trail clearing, vehicle maintenance and represented NPS employees in local parades.</i>
Physical Training	10%	<i>Each crew member is expected to PT for at least an hour every day.</i>

* Lead monitor participated in a 75 day detail to a rappel crew. Training and wildfire hours were not included because they did not pertain to the fire effects crews' accomplishments.

** Furlough hours were not included because they did not pertain to the crews work accomplishments.

E. 2019 Direction

In the future the BICY Fire Effects program will work to into utilizing field FFI entry for easy data sharing and the utilization of Minitab, Survey 123 and Arc Collector for data analysis and collection.

Additional projects will be undertaken to improve our data assessment procedures, including but not limited to developing a Photo Load series utilizing our primary fuels. This is a work in progress and will likely take several years to complete and the information will be included in the updated Fire Effects and Monitoring Plan.

F. Overall Data Entry Status and FFI suggestions

Program Data - In an effort to ensure the longevity of NPS fire effects monitoring data, please provide the following:

- List FFI databases for which no new data were collected this year.
 - None
- Estimate of the percentage of your park/network **total** monitoring program data (including past and present data) that has been entered into FFI, or another application, and quality checked (e.g. Are there any non-digital, hard copies of data still floating around out there?)
 - 100% of photoseries project data
 - 100% of 2019 photopoint data
 - 5% of historical photopoint data
- Do you have a need for migration of any data to FFI?
 - Historical data is being entered into FFI via National Office for 2018 and prior.

FFI Feedback

- Suggest color change between rows of entries (i.e. tables in Excel)

G. Optional Information

Challenges facing monitoring program

- May need to modify start time for seasonal staff onboarding.
 - Seasonal staff typically starts in October and leave by late March to early April in order to support the western fire season. A large majority of monitoring is done March through May, this lack of staffing during the core of our data collection times (ie. wildfire season) is problematic.
 - Changes within the organizational structure is in progress to help address this issue.
- Are the current monitoring objectives addressing resource management concerns?
 - Discussed during meetings with RM.
 - Additional support options have been identified with South Florida/Caribbean I&M Network.

Additional Monitoring Information:

Effects of an extended hydroperiod

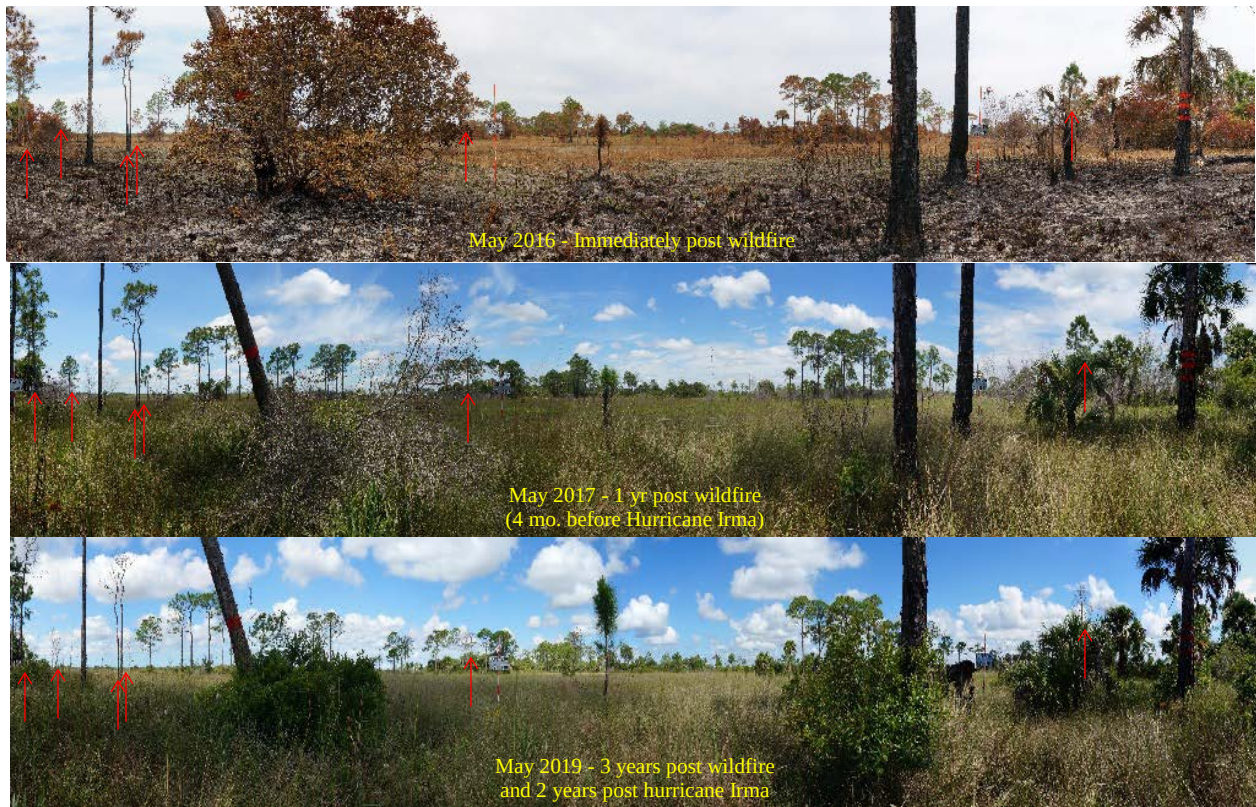


Figure 1: The photopoint monitoring plots showed the pattern of pine mortality not caused solely by wildfire.

The photo series above shows a number of trees that experienced a wildfire in 2016 and survived. Slash pine typically die within a year of fire disturbances, however, these trees are alive and did not visually show signs of stress when observed in May 2017 (1 year after the wildfire). Most of these trees had a majority of their crown intact low scorch and char heights were observed on the trees although they burned in a wildfire.

A few days after this photograph in late May 2017, a large rain event occurred dumping approximately 24 inches of rain in the area. South Florida remained saturated through Hurricane Irma which came through in September 2017 and the majority of pinelands did not dry out until October or November. The typical hydroperiod within South Florida pinelands is 0 to 2 months. However, in 2017, five to seven months of standing water was observed in the pinelands of Big Cypress National Preserve (BCNP).

The landscape effects of this disturbance was never truly mapped. Several trees throughout the Preserve were stressed or appeared to be dying by the early spring of the following year, presumably impacts from both standing water and the hurricane force winds. These ecological effects were likely compounded during the dry spring of 2018.

BCNP experienced numerous fires in the spring of 2018 and extremely high pine severity was observed in these areas. Interestingly, the area (*Figure 1: above*) did not burn in the 2018 wildfires. The area burned in a low intensity wildfire in 2016 (two years earlier), but the pines observed 8 months after Hurricane Irma and the long duration high water event had died anyway. The unusual pine mortality was observed in other areas of the Preserve that also did not experience the effects of a high severity wildfire during the 2018 fire season.



Figure 2: Pine mortality observed in 2019.

The photo series (*Figure 2: above*) captured two treatments within three years. This plot burned in 2015 during a prescribed burn. There was nearly complete consumption of understory shrubs and light fuels, causing higher char and scorch height to overstory. The intensity of the fire did not cause curling of the overstory needles that would indicate a very high fire intensity. Site visit documentation did not note that the apical meristems were damaged in the trees surrounding the plot or that the crew expected any unusual amount of mortality. The majority of the trees still had green tops.

The plot was revisited in 2016 (1- year post burn) and the native overstory vegetation did not appear to be stressed or dying. One large *Melaleuca* died in the fire and one survived.

This area burned again during the Avian Complex (Imd Post 2018). The light fuels were consumed and shrubs were top killed. Instead of the high intensity severe wildfire effects that were observed elsewhere in the fire area, this area had low char and scorch heights on the overstory trees. The large cabbage palm that was scorched completely in 2015, still had some green on the fronds after it burned in the Avian Complex.

It initially appeared that the prescribed burn two years before the wildfire significantly reduced the overstory mortality because there was less tall/dense understory vegetation. However, the 2019 site visit showed a patch of overstory mortality on the western side of the plot.

The monitoring crew will continue with a 3-year site visit in 2021 and look for other areas with a similar pattern. The crew may explore that area more closely for clues that lead to the increased mortality on only one side of the plot. Information that may be noted in the future includes: closeness of the dead pine patch to the nearby cypress (which typically holds water longer), stems per acre in dead patch compared to the rest of the plot, specific understory differences between two areas, and documentation of any new melaleuca in the area. The overstory vegetation in this area likely died due to several contributing factors that have yet to be explored, but implementation of additional spatial monitoring may help document these changes over time.

High severity wildfires can have devastating effects on the ecosystem, but it is unlikely that fire alone was the sole contributor to the unusual mortality. The area (*Figure 3: Below*) was not photographed prior to burning during the Avian Complex (2018). However, considering the pattern of pine mortality throughout other areas of the Preserve it is likely that there was already at least some mortality from the long-duration high water event in 2017.



Figure 3: The photo above is of an area that burned during a fast moving, wind driven wildfire during the dry spring of 2018, but was fire likely not the only contributing factor.

In addition to some mortality that likely already occurred in the area (*Figure 3: Above*), stand dynamics and fire return interval also likely further proliferated the severity in this area. Hundreds of stems per acre and a small diameter breast height (DBH) were observed on most trees. Historical accounts of Florida slash pines show fewer trees per acre and a more open understory. Additionally, this area (*Figure 3: Above*) had not burned since 2011. A dense shrub component and high ladder fuel height also likely contributed to the high overstory mortality.

The Melaleuca Outbreak

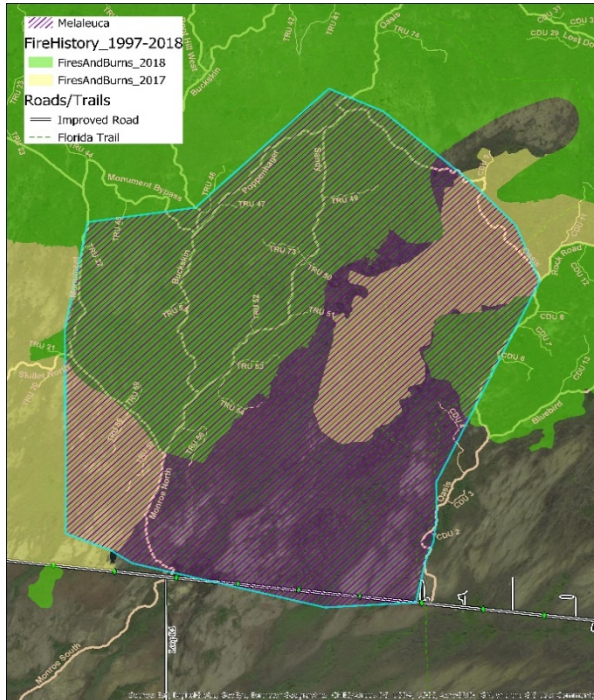


Figure 4: 2017 and 2018 fire history overlay with melaleuca infestation area.

In April 2019, melaleuca was mapped (Figure 4: above) and areas of concern were cross compared with prescribed and wildfires within the last three years. The most recent disturbances in the area have been a winter prescribed burn (Jan. 2017) and spring wildfire (May 2018).

Melaleuca seedlings were found in both the prescribed burn and the wildfire areas. However, field observations show a higher concentration of seedlings in areas with moderate to high pine mortality, primarily within the Avian Complex fire area.



Figure 5: Melaleuca seedlings measuring at approximately 1.5 meters in height.

In addition to their ability to proliferate in large numbers after a fire disturbance, Melaleuca plants typically survive long periods of water inundation (6-9 months). Plants have been documented growing faster under conditions with longer hydroperiods. These two disturbances, fire and water, likely contributed to the dense infestation, particularly within the Avian Complex, however additional contributing factors may not have been identified yet.

BAR funded herbicide treatments have begun in the Avian Complex area and will assist with reducing the seed source and potential impacts to other areas. Monitoring crew and Resource Management will continue to document the effects of fire and melaleuca within these areas.

Pine Stand Effects After Multiple Wildfires



Figure 6: Wildfires have reduced the number of old growth pine trees, increased the crown spacing of the remaining trees and reduced the understory vegetation.

Managed wildfires and suppressed wildfires have been a discussion point at BCNP for the last few years. This stand is an example of high concern from both the public and resource managers about the effects of all types of wildfires. There are costs and benefits to the ecosystem whether a fire is managed or fully suppressed.

A pineland west of Boothill was treated twice in the last four years in two separate dry season managed wildfires. The initial impacts shown an immediately post photograph of the Mud Lake Complex (*Figure 6: Photo 1*) looked devastating. Numerous Red Cockaded woodpecker trees in the area were saved by fire personnel, but the level of potential pine mortality of other potential nesting sites initially appeared to be catastrophic.

Using ocular vegetation estimates, the repeated treatments did show that some trees died and a lower number of stems per acre were visible. However, interestingly in addition to the increased crown spacing for a large number of old growth pine trees, the understory woody shrub component has also been substantially reduced when observed in 2018 (*Figure 6: Photo 3*). This decrease in woody shrub height has been repeatedly observed in other areas of the Preserve when areas are burned after the growing season has started (ie. cypress have started leafing out), however, there are limited observations of frequent repeated wildfires during the very dry part of the growing season.

Often typical dormant season (winter prescribed burning) will reduce woody shrub heights approximately 50% when re-measured one year after a burn, and vegetation will reach pre-burn height within two to three years. At this growth rate it is very difficult for Fire Management to identify the highest priority areas in need of prescribed fire. More acres are identified than the crew can practically treat every year. However, growing season fires reduce woody shrub height and density and increase the length of time it takes woody shrubs to reach pre-burn levels hence increasing the length of fire effectiveness (ie. the length of time it takes to reach pre-burn fuel height and density).

Although growing season fire treatments are optimal when fire occurs during the growing season and with saturated soils, there may be some ecological benefits to managing wildfires under certain conditions.

- If the area (Figure 6: above) had not burned during the Mud Lake Complex and the understory vegetation had an additional three years' worth of growth, how many more trees would have died in the 2018 wildfires?
- Identification of long-term benefits of greater spacing within dense pines.
- Reduction of woody shrubs in the surrounding prairie with multiple fires so close together.
- Varying intensity and seasonality of fires across the landscape is known to increase species richness and diversity.

The monitoring crew will continue to observe and document ecological effects of both wildfires and prescribed fires. New tools are currently being explored to better extrapolate estimates and monitor changes over time. Increased communication with Resource Management and cooperators will allow monitors to explore the effects of these fires on the ecosystem and, in particular, its relationship to threatened and endangered species.